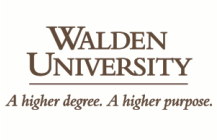

2019

Implementing a Sepsis Protocol in a Long-term Care Hospital

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This is to certify that the doctoral study by

Kristine Harral

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Walden University
2019

Abstract

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MSN, Walden University, 2015

BSN, Walden University, 2015

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Sepsis is life-threatening organ dysfunction caused by a response to infection that causes multiorgan failure. This condition causes high mortality and morbidity rates and leaves permanent disabilities. The purpose of this project was to create a sepsis protocol and an education training program for clinical staff in a hospital setting where no sepsis protocol was in place. The practice-focused question examined whether an educational program would improve clinical staff perception of their knowledge of the early recognition and management of sepsis. A literature review was conducted to identify an evidence-based practice protocol; the results were used to develop the education program for the clinical staff at the site. Malcolm Knowles's theory of adult learning framed the project that included a team of 9 content experts consisting of physicians, physician assistants, and an educator who reviewed and approved the protocol and education program prior to implementation. The education program was then presented to 45 staff members including physicians, licensed vocational nurses, registered nurses, physician assistants, and nurse practitioners. Results of a 14-item knowledge test before and after the education program were examined for percent correct; results were compared using a paired-samples *t* test. Participant knowledge increased significantly *($p < .05$)* from 20% correctly answering 10 of the 14 questions on the pretest to 87% answering all of the posttest questions correctly. The results of this project may promote positive social change by supporting clinical staff in early recognition and treatment of sepsis thereby reducing the morbidity and mortality that accompanies sepsis.

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Dedication

This DNP project is dedicated to my husband, Mike, my daughter, Brooke, and my son, Austin, for their continued unwavering support and understanding for the time and focus it has taken away from our family to complete this project. You all are my life and I love you very much! Finally, to my dad and mom, Bliss and Jean Mabis, I did it! Thank you for always encouraging me and pushing me to achieve my dreams despite any roadblocks and supporting me in my endeavors as crazy as they are. I am so blessed to call you both my dad and mom. I love you more than words can describe!

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I want to acknowledge my professors and Walden University for the continued support in completing my DNP. Particularly, Dr. Diane Whitehead for your support and encouragement believing in me when I did not believe in myself. To you, I am forever grateful I will never forget your dedication.

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Section 1: Overview of the Evidence-Based Project

Introduction

One challenge to positive patient outcomes is sepsis mortality and morbidity rates. Sepsis is a life-threatening organ dysfunction caused by a response to infection and is associated with significant morbidity and mortality if not promptly recognized and treated (Singer et al., 2016; Yealy et al., 2015). Mortality rates for sepsis are approximately 30% and 70% for septic shock, and approximately 258,000 people die each year from sepsis with the number increasing approximately 8% per year (Gauer, 2013; Rhee, Gohil, & Klompas, 2014). To address this issue, the Society of Critical Care Medicine developed guidelines for managing severe sepsis and septic shock in 2012 with updates published in 2016 (Rhodes, 2017). Early sepsis identification leads to timely treatment and reduces morbidity and mortality, which decreases readmissions and the cost of care (Kleipell & Schorr, 2014).

Long-term acute care postintensive units act as specialized hospitals for patients who require long-term mechanical ventilation along with other chronic critical illnesses (Kaukonen et al., 2015). This applies to the 10% to 20% of patients recovering from sepsis experience organ failure who require complex care for a long time (Prescott, Langa, Liu, & Iwashyna, 2014). However, regulations for long-term hospitals are strict; if a patient has Medicare and they are transferred out to a higher level of care, the patient must return within three midnights or the Centers for Medicare and Medicaid Services will withhold payment reimbursement (Centers for Medicare and Medicaid Services, n.d.). This regulation could cause the facility loss of revenue. Because sepsis is serious,

and reimbursement can be affected, there is an international push for hospitals to have a sepsis protocol (Kahn et al., 2010).

Problem Statement

The problem addressed in this project was the lack of a sepsis protocol along with an appropriate training program to assist caregivers in applying the Surviving Sepsis Campaign interventions. The practicum site does not have a sepsis protocol in place, and the readmission rates to a higher level of care were above the national average. To decrease readmission and mortality rates, recognizing the early warning signs of sepsis is imperative. Having a sepsis protocol will assist the clinical staff to recognize early warning signs. Additionally, an education program on sepsis awareness can improve the knowledge deficit of health care practitioners (Vandijck, Blot, & Vogelaers, 2009). The purpose of this project was to develop a sepsis protocol and present a sepsis education program for clinical staff providing care at the facility.

There is evidence-based literature to support the early warning signs included in a sepsis protocol. There is an early detection of sepsis through observations of vital signs and organ failure in the emergency room, but there is currently less focus on observation and treatment for patients on the medical floors (Torsvik et al., 2016). Patients who have already acquired sepsis in the short-term acute hospitals are at risk for acquiring sepsis again, making the mortality rates much higher for those patients admitted to long-term care facilities. Approximately one in five patients who are admitted with severe sepsis are readmitted within 30 days of their discharge date (Donnelly, Hohmann, & Wang, 2015; Kahn et al., 2010). However, multicomponent interventions have reduced

readmissions through education and training and reduced the number of patients returning to a higher level of care (Kripilani et al., 2014). Providing education to clinical staff on the new sepsis protocol can reduce the number of transfers to acute short-term facilities, which will reduce facilities' readmission rates.

Purpose

The purpose of this project was to develop a sepsis protocol and sepsis education program in a long-term care facility. This project included researching evidence-based guidelines for the recognition and management of sepsis in the long-term acute setting and developing order sets for the sepsis protocol. The objectives were to decrease readmission rates and increase the knowledge and competence of practitioners on treating patients with sepsis. The practice-focused question to address the purpose was "Will an educational program improve clinical staff perception of their knowledge on early patient recognition identification and management of sepsis?"

Nature of the Doctoral Project

This project addressed a gap in practice at the practicum site regarding a lack of a sepsis protocol and education program to assist caregivers in applying Society of Critical Care Medicine interventions. These evidence-based care bundles are guidelines to practitioners to identify and manage sepsis. A care bundle is a set of interventions to be used to improve patient outcomes (McClelland & Moxon, 2014). The sepsis bundle is composed of 3-hour resuscitation and 6-hour septic shock bundles (Lopez-Bushnell et al., 2014). Included in the 3-hour resuscitation bundle is a timely administration of antibiotic therapy. According to research, antibiotic therapy should be provided within the first 60

minutes of the diagnosis of sepsis (Gauer, 2013; Kumar et al., 2006). Hospitals that have used the early goal directed therapy programs have shown a 45% risk reduction in the mortality rates for sepsis (Gauer, 2013).

This project followed the guidelines from the Walden University DNP Staff Education Manual. Evidence for the project was collected through a literature search using Walden University online search engines. Key words included *sepsis; sepsis shock, sepsis bundles; bundles; sepsis interventions; surviving sepsis campaign, nurses, screening; sepsis protocol; sepsis educational programs;* and *sepsis implementation*. Evidence was limited to English, peer-reviewed journals from the past 5 years.

Significance

According to the Centers for Disease Control (2017), more than 1.5 million people get sepsis each year, and about 250,000 of these people die each year. A person dies every 2 minutes from sepsis which is more than prostate cancer, breast cancer, and AIDS combined. Consequently, mortality rates increase by 8% every hour that treatment is delayed (CDC, 2017)—8% of deaths from sepsis could be prevented with early recognition and diagnosis along with rapid interventions. Although sepsis is more likely to affect young children and the elderly, it affects everyone.

Like many other diseases such as congestive heart failure, myocardial infarction, or ischemic strokes, the identification and treatment of sepsis is time sensitive. Patient outcomes depend on aggressive interventions to restore perfusion to vital organs (Dellinger et al., 2013). Over half of the patients admitted with sepsis require admission to intensive care units (Rowe et al., 2016). However, nurses are at the forefront of

implementing evidence-based practices to promote better outcomes (Kleinpell & Schorr, 2014). Education and training on interventions has reduced the number of patients returning to a higher level of care (Kripilani et al., 2014). Therefore, this project can improve patient outcomes by providing education at the practicum site on a sepsis protocol that can reduce the number of transfers to acute short-term facilities readmission rates.

Summary

Section 1 introduced the problem of sepsis, which affects hundreds of thousands of persons each year. Mortality and morbidity rates are high for patients who acquire sepsis or sepsis shock. Guidelines and sepsis bundles have been created for the early identification and recognition of the early warning signs of sepsis. By developing a sepsis protocol and education program for all practitioners, mortality and morbidity rates can drop. Moreover, the early recognition of sepsis will allow facilities to treat those patients upon the onset of sepsis, thereby reducing patient transfers to higher levels of care, which will also decrease costs to facilities and create positive patient outcomes. Section 2 includes a description of Malcolm Knowles's theory of adult learning that framed this education project. The evidence-based literature supporting sepsis education is also introduced and my role in the project is clarified.

Section 2: Background and Context

Introduction

The problem addressed in this project was the lack of a sepsis protocol and an appropriate training program to assist caregivers in applying the Surviving Sepsis Campaign interventions. The project question was "Will an educational program improve clinical staff perception of their knowledge on early patient recognition identification and management of sepsis?" The facility did not have a sepsis protocol in place and the readmission rates to a higher level of care were above the national average. Patients who have already acquired sepsis in the short-term acute hospitals are at risk for acquiring sepsis again, making the mortality rates much higher for those patients admitted to long-term care facilities. Approximately, one in five patients who are admitted with severe sepsis are readmitted within 30 days of their discharge date (Kahn et al., 2010; Donnelly et al., 2015). Section 2 includes information on the theory that guided this project and the literature that supports the relevance of the project to nursing practice.

Concepts, Models, and Theories

Malcolm Knowles's theory of adult learning can be used for teaching adults (Kaufman, 2003). Knowles's term *andragogy* follows five assumptions about how adults learn and their attitudes and motivation for learning: (a) adults are independent and self-directing; (b) they have accumulated a great deal of experience; (c) they value learning that integrates with the demands of their life; (d) they are more interested in immediate problem centered approaches than in subject centered ones; and (e) they are more

motivated to by internal drives than external ones (Kaufman, 2003). Knowles's change model assisted in guiding this evidence-based quality improvement project with the desired improvement in the quality outcomes through the early identification of the warning signs, which will improve the overall quality and mortality and morbidity rates. Table 1 shows how this model aligns with the sepsis education program.

Table 1

Alignment of Theory of Adult Learning and Sepsis Education Program

Adult learning theory principles	Sepsis education program
Adults are independent and self-directing	Various educational resources will be shared that can be utilized by the nurses
Adults learn from past experiences	Participants will share past cases or experiences
Adults value learning that they can incorporate into daily activities	Examples of sepsis cases and interventions will be shared
Adults are interested in dealing with immediate problems	The early warning signs of sepsis will be shared along with the protocol
Adults are motivated internally	Hands on training with mock scenarios will be shared

Relevance to Nursing Practice

Sepsis Bundle

The Surviving Sepsis Campaign created guidelines for identifying and managing sepsis and were identified by a sepsis bundle. The bundle was the outcome of a committee with 68 international experts from 30 different organizations. The committee used a Grading system for the Recommendations, Assessment, Development and Evaluations (GRADE) system to establish the strength and quality of the evidence that were gathered. The first hour to within the first 3 hours is focused on resuscitation, and the next 3 hours, up to 6 hours, are focused on managing septic shock. The early goal

directed therapy is necessary for the management of sepsis and septic shock during the first 6 hours after diagnosis. The specific elements included in the bundles are outlined in Appendix A.

Importance of Provider Education

It is important to implement sepsis protocols and educate healthcare staff to identify and treat sepsis (McCaffery et al., 2016). Patients with sepsis have a 75% longer average length of stay than those with other conditions and impose a significant financial burden, so nurses need to be educated to identify and treat sepsis. Accordingly, sepsis bundle interventions need to be delivered within 3 hours and 6 hours of identification (McCaffery et al., 2016). Elements that can assist nurses in identifying sepsis include a change in temperature >38.3, or <36 degrees Celsius; heart rate >90, respiratory rate >20 breath/min, white cell count <4 or >12 g/L, blood glucose >7.7 mmol/L, no diabetes, and a new altered mental state (Daniels et al., 2010).

Studies have shown that education improves nursing knowledge and helps establish protocols. For example, Tromp et al. (2010) performed a before and after intervention study with a focus on a nurse-driven care bundle-based sepsis protocol. The bundles included obtaining blood cultures for lactate levels to identify tissue hypoperfusion, performing diagnostic tests like blood cultures prior to giving antibiotics to obtain an immediate diagnosis, and administering broad spectrum antibiotics to the patient within 1 hour of identifying that the patient is septic. Results showed improvement in several areas such as lactate improving from 23% to 80%, taking a chest x-ray from 7% to 83%, taking a urine culture from 49% to 67%, and starting antibiotics

within 3 hours improved from 38% to 56% (Tromp et al., 2010). Therefore, the education for nursing staff helped establish a functional protocol.

Other studies have shown the success of implementing bundles for sepsis intervention. Miller et al. (2013) conducted an observational study of the Surviving Sepsis Campaign's resuscitation and maintenance bundle in 18 intensive care units in 11 hospitals in Utah and Idaho. The study was conducted in three stages with the first study focusing on baseline and bundle development (n = 1,314) conducted from January 1, 2004 to December 31, 2004. The second stage was the implementation stage (n = 4,115) and occurred from January 1, 2005 to December 31, 2007. The third stage was the tracking stage (n = 9,590), which occurred from January 1, 2008 to December 31, 2010. Patients from the intensive care unit and emergency department over 18 years old were included in the data. Results of the study included a decrease in mortality rates of 59% to 21.2% in 2004 and 8.7% in 2010. Bundle compliance increased from 4.9% in 2004 to 73.4% in 2010, a 68.5% increase in bundle use. Further, the lactate measurement, blood cultures and compliance with antibiotic administration did not progress to the 6-hour bundle within the first 24 hours (Miller et al., 2013). Thus, there was an increase in compliance with the Survival Sepsis Campaign's bundles and a significant decrease in mortality rates. Additionally, patients received the appropriate interventions early, which made them ineligible for the subsequent bundles.

Further research has also supported the decrease in mortality rates from increased intervention use. Jacob et al (2012) conducted a prospective before and after evaluation of the intervention (n = 426) and observational cohorts (n = 245) with severe sepsis in the

medical unit. The intervention cohort received care from a dedicated medical professional received early, monitored sepsis management of fluid resuscitation, antibiotics within the first hour of the identification of sepsis and 6-hour monitoring. The observation cohort received care from a primary medical team with interventions of fluid resuscitation, antibacterial administration and patient monitoring. The comparative data collected included the effects of early, monitored sepsis management on a 30-day mortality between the intervention and the observation cohorts enrolled from July to November 2006. The result showed a higher fluid volume was administered to the intervention cohort than to the observation cohort. In addition, the intervention cohort received antibiotic therapy within 1 hour earlier than the observation cohort. The results of the study showed that mortality rate was decreased in the intervention cohort than the observation cohort. This study showed that early monitored management of severely septic patient improved patient outcomes.

Another study evaluated the impact of using the guideline set by the Society of Critical Care Medicine in a community-based teaching hospital (Nguyen et al., 2012). Despite receiving similar are regarding appropriate early antibiotic administration (n = 96), the treatment group (n = 62) had a higher survival rate (73%) compared to the control group (43%). The two groups were differentiated by early fluid resuscitation. This outcome of this research was weakened due to the small sample size.

Chege and Cronin (2007) described early evidence of treatment for sepsis as far back as the early Chinese emperors (McClelland & Moxon, 2014). However, it was not until 1991 that definitions of sepsis were published. More recently, organizations such as

the Surviving Sepsis Campaign and the Global Sepsis Alliance, created a partnership to raise awareness and provide guidance on the identification of sepsis. Improvements have been made with the Surviving Sepsis Campaign to improve the identification of those patients at risk and the delivery of the early interventions. The magnitude of sepsis is shocking and the complexities of sepsis lead to inaccuracies in assessing the incidence of sepsis. Sepsis is an extremely complex process, and typical signs and symptoms may not occur in all patients. The impact of this disease is considerably high with a mortality rate of approximately 50% which is increasing through severe sepsis and sepsis shock (Vincent, 2002). The Surviving Sepsis Campaign aimed at creating a multifaceted implementation program of nurse-driven, care bundled sepsis protocols. This multifaceted program would be followed by education, training and competencies. These protocols were to measure and improve patient care since nurses are directly involved in patient care and the identification of the warning signs of sepsis. Table 2 shows the early warning signs for a systemic inflammatory response as they relate to sepsis.

Table 2

System Inflammatory Response Syndrome Criteria

Criteria	Metric	Comment
Temperature	>100.4° F (>38.0°C) or <96.8°F (<36.0°C)	Either hyperthermia or hypothermia is a SIRS criterion
Heart rate	>90 beats per minute	Only tachycardia
Respiratory rate	>20 breaths per minute	If the patient is mechanically ventilated, $PaCO_2$ <32 mm Hg
White blood count	>12,000/mm^3 or <4,000/mm^3 or >10% immature forms	Any one of these parameters is sufficient for this category

Note. Patients are diagnosed with systemic inflammatory response if they meet two of the four criteria.

With the appropriate education and development of sepsis protocols, nurses will be able to identify the warning signs and will affect the outcomes of patients. Providing appropriate training to nurses will increase their knowledge which will help ensure that patients with sepsis will receive therapies that are based on the most current evidence-based guidelines.

Local Background and Context

The population that the facilities' serve is between 40 and 100 years old and is of low to middle income families. The local rates for readmissions to a higher level of care are above the national average for all area facilities. Currently, the facility does not have a sepsis protocol, nor does it provide education on the most current evidence-based practices. Other long-term acute hospitals in the area also do not have sepsis protocols. During the practicum I interviewed registered nurses and physician assistants about sepsis protocols. There was a consensus that protocols and education is needed to assist in the identification of sepsis. They all agreed that education on the evidence-based data and the development of protocols will reduce readmission rates to higher levels of care and decrease mortality rates.

Role of the DNP Student

During my nursing career, I have personally witnessed many changes in health care. As an ICU and trauma nurse, I have seen the disease of sepsis increase in the prevalence and vulnerability to patients. I have experienced the variances from

difference facilities and practitioners in how sepsis is identified and treated. It was not until a few years ago, that I personally observed hospitals changing their electronic medical record programs to assist with the identification of the early warning signs of sepsis and in how to treat patients. However, I also became aware that the systems were not accurate many times. I observed that practitioners would treat patients differently depending on their symptoms. Sepsis, just as many other diseases, can present in various fashions and no two cases are alike. I vowed to myself that if I ever became a nurse leader that I would devote time and effort into creating an evidence-based protocol to help nurses identify sepsis. My role in this project was to develop the sepsis education program and provide the education to the staff.

Summary

Section 2 introduced the Malcolm Knowles Theory of Adult Learning and described how this theory frames this project. A review of current evidence supporting implementation of the evidence-based sepsis protocol and the results of this implementation with positive patient outcomes and decreased mortality rates was reviewed. The project question was "Will an educational program improve clinical staff perception of their knowledge on early patient recognition identification and management of sepsis?" An overview of the local background and context for the project were described. My role in developing, implementing, and evaluating this project using the guidelines in the Walden University DNP Manual for Staff Education was discussed.

Section 3: Collection and Analysis of Evidence

Introduction

The purpose of this education project was to develop a sepsis protocol and education program for practitioners and nurses in a long-term acute care facility. This project included pre- and post-knowledge evaluations prior to the project implementation. An expert panel was used to review the proposed sepsis protocol and staff education program. Results of the pre- and post-knowledge surveys guided further revisions and education of staff. Section 3 describes the process of planning, implementing, and evaluating the project.

Practice-Focused Question

This project addressed a lack of a sepsis protocol at a long-term facility and readmission rates that were above the national average. The practice-focused question was "Will an educational program improve clinical staff perception of their knowledge on early patient recognition identification and management of sepsis?" This project included the creation of a sepsis protocol that allowed practitioners and nurses to quickly identify the early warning signs of sepsis. The protocol included the 1-hour sepsis bundle and 3- to 6-hour bundle for immediate implementation of the interventions necessary to care for patients.

Sources of Evidence

Planning

A sepsis protocol (Appendix B) and education program (Appendix C) were developed to complete this project. This section outlines the steps of the curriculum development process for the sepsis protocol and education program:

1. Explored project with project team: physicians, physician assistants, educator, chief nursing officer, vice president of quality improvement.
2. Shared evidence-based research and data with project team.
3. Obtained signed letter of participation from CEO.
4. Developed learning objectives.
5. Established timeline.
6. Developed the practitioner and nurse training curriculum.
7. Developed the sepsis protocol.
8. Developed pre- and post-surveys.

After IRB approval, an expert panel was invited to participate in the program. These participants included the nurse educator, vice president of quality improvement, a doctoral prepared chief nursing officer and the facility medical director.

Protections

The letter of participation from the DNP Manual on Staff Education was signed by the facility. Approval to implement the project was received from Walden University IRB (approval no. 02-25-19-0437807). Participants signed the consent for anonymous

questionnaires from the same manual. Completed surveys will be kept in a locked cabinet for 3 years.

Implementation

An invitation was e-mailed to nurses and practitioners at the facility inviting them to participate in the education program. To accommodate different schedules, there were two different times participants could select to attend the program. Participants signed the consent form to participate, which was based on the one in the DNP Staff Education Manual. A presurvey was given to the participants prior to the education program. After the education program participation, the participants were given the same survey as a post survey (Appendix D).

Evaluation

This project was guided by the Institute of Medicine (2009), now the Health and Medicine Division, recommendation to develop an educational curriculum for nurses that is focused on knowledge and skills development to enable the provision of quality care. Participants completed a pre- and post-knowledge survey at the beginning and end of the education program. The participants in the project also submitted a summative evaluation at the end of the project related to the learning objectives of the project.

Analysis and Synthesis

The participants engaged in a pre- and post-survey. Data analysis includes descriptive statistics and a *t* test for independent samples. The findings of the evaluations will be shared with the expert panel, CEO, and administrative leadership within the organization.

Summary

This project addressed a gap in practice at the practicum site regarding sepsis protocol and education. The project question was "Will an educational program improve clinical staff perception of their knowledge on early patient recognition identification and management of sepsis?" Section 3 described the planning, implementation, evaluation, and analysis for this project. Section 4 presents the results of the surveys and evaluations.

Section 4: Findings and Recommendations

Introduction

This education project took place in a long-term acute-care hospital in the southern United States. The facility was a 90-bed facility with approximately 130 employees. The project included physicians, licensed vocational nurses, registered nurses, physician assistants, and nurse practitioners. Malcolm Knowles's theory of adult learning was used to develop a sepsis protocol and education program for successful sepsis implementation. The goal was to create a sepsis education program and protocol for practitioners and nurses to recognize the early signs of sepsis. With proper education and implementation, patients and society can benefit from the reduction in mortality and morbidity rates, the number of patients sent to higher levels of care, and costs.

Findings and Implications

The focus of this project was the development and presentation of a sepsis protocol focused on the identification of patients with indications of any systemic inflammatory response syndrome, sepsis, severe sepsis, and septic shock. Involvement from an expert doctoral project team of nine included input from four physicians, two physician assistants, an educator, a chief nursing officer, and a vice president of quality improvement. The involvement of the clinical experts and ancillary personnel was significant to the development of the education and sepsis protocol due to their involvement directly with patients. Research has supported that an expert team leads to a successful sepsis program (Capuzzo et al., 2012). The expert panel suggested ensuring the education is disseminated among the staff yearly and among new hires. Another

suggestion was made to create a sepsis code team so when sepsis is suspected a code is overhead paged for the sepsis experts to respond. Creating a sepsis meeting with practitioners and nurses monthly to discuss sepsis cases was also suggested. The feedback from the expert doctoral project team was positive and helped improve the project. The project team played an integral part of the successful sepsis program during the development of the sepsis protocol.

Sepsis education is necessary to increase adherence to sepsis guidelines (Palleschi et al., 2014). The education program used a pre- and post-knowledge test to assess participants' increased sepsis knowledge. There were 45 participants who took part in the program: five physicians, 15 licensed vocational nurses, 15 registered nurses, five physician assistants, and five nurse practitioners. All 45 participants took part in the pre-survey, the education, and post-surveys. All the participants expressed the need for a sepsis protocol and educational program. Table 3 shows the percentages of correct responses for the pre- and post-knowledge question survey results. A *t* test for paired samples revealed a significant difference ($p = .000$) in knowledge between pre- and post-responses at the 0.05 confidence interval. Participants also completed pre- and post-education program surveys on their perceptions of knowledge and confidence in caring for sepsis patients. The pre-survey consisted of a total of nine questions and the post-survey consisted of two additional questions and any comments. The results of the post-surveys indicated that participants indicated an increase in their knowledge of sepsis and their ability to care for patients with sepsis. Tables 4 and 5 depict the results of pre- and post-program evaluation results.

Table 3

Pre- and Post-Knowledge Test Results

Survey Questions	Pre-education correct responses ($N = 45$) % correct	Post-education correct responses ($N = 45$) % correct
1. What is sepsis?	100	100
2. How many people are affected by sepsis each year?	24.4	86.7
3. Complications from sepsis can include:	6.7	93.3
4. What blood test is used to assess tissue perfusion in a patient with sepsis?	28.9	97.8
5. When should antibiotic therapy begin for suspected sepsis?	48.9	91.1
6. The goals initial resuscitation of sepsis-induced hypoperfusion should include all of the following as one part of a treatment protocol, does NOT include:	53.3	100
7. What two symptoms constitute sepsis?	88.9	95.6
8. Antibiotics to be used for the first 3-5 days are:	46.7	91.1
9. Septic shock is defined as a subset of sepsis in which the patient has profound:	57.8	86.7
10. Which of the following is NOT likely to be a complication after surviving sepsis?	55.6	93.3
11. Adults older than 65 are ____ times more likely to be hospitalized with sepsis than adults younger than 65.	28.9	93.3
12. When someone has severe sepsis their chances of survival drops by almost 8% for every ____ that goes Tables 4 and 5by without treatment.	71.1	93.3
13. Who is at highest risk for developing sepsis?	60	100
14. All the following are signs of sepsis EXCEPT:	93.3	100

Table 4

Pre-Education Program Knowledge, Skills, and Confidence Survey

Survey Questions	Very poor 1-2	3-4	5-6	7-8	Very good 9-10
1. Please rate your knowledge of sepsis.	10	5	21	0	9
2. Please rate your knowledge of severe sepsis.	10	5	21	0	9
3. Please rate your knowledge of SIRS.	8	7	19	7	4
4. Please rate your confidence in taking care of someone with sepsis.	12	5	18	7	3
5. Please rate your knowledge of early warning signs of sepsis.	14	7	13	7	4
6. Please rate your knowledge on how to treat the onset of sepsis.	12	9	16	5	3
7. Please rate your confidence in implementing a sepsis protocol into practice.	0	0	28	12	5
8. Please rate your confidence in implementing the sepsis bundles.	0	6	24	8	7
9. Please rate your confidence on recognizing the early warning signs of sepsis.	11	10	15	6	3

Table 5

Post-Education Program Knowledge, Skills, and Confidence Survey

Survey Questions	Very poor 1-2	3-4	5-6	7-8	Very good 9-10
1. Please rate your knowledge of sepsis.				12	33
2. Please rate your knowledge of severe sepsis.				12	33
3. Please rate your knowledge of SIRS.				12	33
4. Please rate your confidence in taking care of someone with sepsis.				10	35
5. Please rate your knowledge of early warning signs of sepsis.				8	37
6. Please rate your knowledge on how to treat the onset of sepsis.				5	40
7. Please rate your confidence in implementing a sepsis protocol into practice.				2	43
8. Please rate your confidence in implementing the sepsis bundles.				5	40
9. Please rate your confidence on recognizing the early warning signs of sepsis.				8	37
10. Please rate your confidence level of sepsis after the training.				32	13
11. Please rate your confidence in caring for patients with sepsis post-training.				20	16

Recommendations

This sepsis education implementation project increased nurses and practitioner knowledge for the early recognition of sepsis and how to implement a sepsis protocol and sepsis bundles. The nurses' knowledge of sepsis is vitally important for the early recognition; therefore, continued education should remain at the forefront for any organization. Dissemination of the materials for new employees and practitioners will be necessary for future success. Leadership and organizational success will depend on continued tracking of metrics, bundle utilization, mortality and morbidity rates, costs and length of stay. Continuing auditing procedures of all sepsis patients for early recognition and the rapid response of bundle implementation will also be necessary for future success.

Strengths and Limitations of the Project

The strengths of the project included involvement from various clinicians such as physicians, nurses and mid-level practitioners. Participations from the various levels of clinical experts allowed for the project to be implemented for all levels of expertise. This DNP project was supported by the President which allowed for time and resources to be made available for implementation. During the planning phase of the project, opportunities were presented from various organizations and evidence-based research that had published implementation and patient improvement with sepsis bundles and protocols. With disease specific protocols, organizations have ample opportunities to apply for quality certifications based on quality data and positive patient outcomes. The disease-specific sepsis certification offers benefits such as improved processes of care,

aids in achieving a culture change, and enhances the hospital's profits by attracting more patients, and leveraging certification as a tool in external stakeholder contract negotiations (The Joint Commission, 2015).

Benefits of this project allowed nurses and practitioners with the most current evidence-based guidelines on the identification of the early warning signs and management of patients with sepsis through the educational of the sepsis protocol. The project also promoted a multidisciplinary approach with members of a team as resources through the planning phase. The expert team provided a comprehensive approach and approval of the sepsis protocol which promoted stakeholder buy-in. The nurses and practitioners appreciated the live education training sessions as it provided real-time feedback which allowed for questions and answers to be addressed immediately allowing for increased protocol understanding and success in implementing the sepsis protocol.

Limitations to the continued monitoring of the project could include low census and staff shortages based on the inability to recognize the early warning signs to quickly implement the sepsis protocol. The facility will have to monitor staff turn-over as new nurses and practitioners will require education on the sepsis protocol. Yearly education for staff will also need to be a focus throughout the year in order to reiterate, re-educate and capture new staff to the facility.

Section 5: Dissemination Plan

Further dissemination of this project should include providing annual updates to all employed clinical personnel and sepsis information during orientation. As suggested by the clinical expert team, the yearly education should also be offered to physicians and mid-level practitioners who are not employed by the facility. An online education model will be created so that staff can assign the education at any time they feel they need a refresher. An online test will be added at the end of the education to test the participants' knowledge. Twice a year, the facility will hold skills fairs and sepsis will be included in the hands-on education and case studies. The facility will also create a code team of the experts to assist in the immediate care of patients suspected or exhibiting the early warning signs of sepsis. The medical director has agreed to be a sepsis champion with the chief nursing officer to monitor, educate, and audit charts as needed for continued patient improvement and the reduction in morbidity and mortality rates.

Analysis of Self

As a doctorally-prepared scholar, learning to write with precision and clarity while reflecting a purpose will advance nursing practice. Advanced degrees such as a Doctorate in Nursing Practice are necessary for research into evidence-based practices to advance nursing practice. During this process, I became confident in leading processes where knowledge and education meet to advance the most up-to-date and current practices in nursing. Participating in this program allowed me to become a better leader, practitioner, and change agent.

Summary

In conclusion, a total of 45 practitioners were participants in this educational project. There was a significant change in the knowledge base of the physicians, nurses, and midlevel providers at the conclusion of the education. Continued education and enforcement of the sepsis protocol along with auditing should be sustained for success.

References

American Nurse Association. (2011). Nurse staffing. Retrieved from http://www.capitolupdate.org

Capuzzo, M., Rambaldi, M., Pinelli, G., Campesato, M., Pigna, A., Zanello, M., . . . Toschi, E. (2012). Hospital staff education on severe sepsis/septic shock and hospital mortality: An original hypothesis. *Anesthesiology, 12*(28), 1-8.

Centers for Disease Control and Prevention, (2017). *Sepsis.* Retrieved from https://www.cdc.gov/sepsis/index.html

Centers for Medicare and Medicaid Services. (n.d.). Prospective payment systems. Retrieved from https://www.cms.gov

Centers of Medicare and Medicaid Services (n.d.). Long-term care hospitals PPS. Retrieved from http://www.cms.gov

Chege, F., & Cronin, G. (2007). Emergency care staff can improve survival rates from sepsis. *Accident and Emergency Nurse;* 15, 157-160. Retrieved from https://doi.org/10.1016/j.aaen.2007.05.003

Daniels, R., Nutbeam, T., McNamara, G. and Galvin, C. (2010). The sepsis six and the severe sepsis resuscitation bundle: A prospective observational cohort study. *Emergency Medicine Journal*; 28:507-512.

Dellinger, R., Levy, M., Rhodes, A., Annane, D., Gerlach, H., Opal, S., …Townsend, S. (2013). Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock. *Intensive Care Medicine*; 39: 165-228. Retrieved from https://doi:10.1007s00134-012-2769-8

Donnelly, J. P., Hohmann, S. F., & Wang, H. E. (2015). Unplanned readmissions after hospitalization for severe sepsis at academic medical center-affiliated hospitals. *Critical Care Medicine, 43*(9), 1916-1927. Retrieved from http://doi.org/10.1097/CCM.0000000000001147

Gauer, R. L. (2013). Early recognition and management of sepsis in adults: The first six hours. *American Family Physician, 88*(1), 44-53. Retrieved from CINAHL Plus with Full Text database.

Institute of Medicine. (2009). America's uninsured crisis: Consequences for health and health care. Retrieved from http://www.iom.edu

Jacob, S. T., Banura, P., Baeten, J. M., Moore, C. C., Meya, D., Nakiyingi, L., . . . Scheld, M. (2012). The impact of early monitored management on survival in hospitalized adult Ugandan patients with severe sepsis: A prospective intervention study. *Critical Care Medicine, 40*(7), 2050-2058. Retrieved from http://dx.doi.org/10.1097/CCM.0b013e31824e65d7

The Joint Commission. (2015). *Types of disease-specific care programs certified*. Retrieved from http://www.jointcommission.org

Kahn, J., Benson, N., Appleby, D., Carson, S., & Iwashyna, T. (2010). Long-term acute care hospital utilization after critical illness. *Journal of American Medical Association, 303*(22), 2253-2259. Retrieved from https://doi.org/10.1001/jama.2010.761

Kaufman, D. M. (2003). Applying educational theory in practice. *BMJ (Clinical research ed.), 326*(7382), 213-216. Retrieved from

https://doi.org/10.1136/bmj.326.7382.213

Kaukonen, K., Bailey, M., Pilcher, D., Cooper, J., & Bellomo, R. (2015). Systemic inflammatory response syndrome criteria in defining severe sepsis. *New England Journal of Medicine, 372*(17), 1629-1638. https://doi.org/10.1056/nejmoa1415236

Kleinpell, R., & Schorr, C. A. (2014). Targeting sepsis as a performance improvement metric: Role of the nurse. *AACN Advanced Critical Care, 25*(2), 179-186. Retrieved from https://doi.org/10.1097/nci.0000000000000015

Kripalani, S., Theobald, C. N., Anctil, B., & Vasilevskis, E. E. (2014). reducing hospital readmission: Current strategies and future direction. *Annual Review of Medicine, 65*, 471-485. Retrieved from http://doi.org/10.1146/annurev-med-022613-090415

Kumar, A., Roberts, D., Wood, K. E., Light, B., Parillo, J. E., Sharma, S., . . . Cheang, M. (2006). Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock. *Critical Medicine, 34*(6), 1589-1596. Retrieved from CINAHL Plus with Full Text Database.

Lopez-Bushnell, K., Demaray, W. S., & Jaco, C. (2014). Reducing sepsis mortality, *MedSurg Nursing, 23*(1), 9-14. Retrieved from CINAHL Plus with Full Text database.

McCaffery, M., Onikoyi, O. Rodrigoplle, D., Syed, A., Jones, S., Mansfield, L., & Krishna, M. G. (2016). Sepsis-review of screening for sepsis by nursing, nursing driven sepsis protocol and development of sepsis hospital policy/protocols. *Nursing and Palliative Care, 1*(2), 33-37. Retrieved from

https://doi.org/10.15761/npc.1000109

McClelland, H., & Moxon, A. (2014). Early identification and treatment of sepsis. *Nursing Times, 110*(4), 14-17. Retrieved from CINAHL Plus and Full Text database.

McGrath, K. M., Bennet, D. M., Boyages, D. I., Lyons, S. C., & O'Connell, T. J. (2008). Implementing and sustaining transformational change in health care: Lessons learnt about clinical process redesign. *Medical Journal of Australia, 188*(6), S32-S35. Retrieved from https://www.mja.com.au/journal

Miller, R. R., III, Dong, L., Nelson, N. C., Brown, S. M., Kuttler, K. G., Probst, D. R., . . . Clemmer, T. P. (2013). Multicenter implementation of a severe sepsis and septic shock treatment bundle. *American Journal of Respiratory Critical Care Medicine, 188*, 77-82. Retrieved from http://dx.doi.org/10.1164/rccm.201212-21990C

National Institute of Health. (2012). Sepsis fact sheet. Retrieved from http://www.nigms.nih.gov

Nguyen, H. M., Schiavoni, A., Scott, K. D., & Tanios, M. A. (2012). Implementation of sepsis management guideline in a community-based teaching hospital – Can education be potentially beneficial for septic patients? *The International Journal of Clinical Practice, 66*(7), 705-710. Retrieved from http://dx.doi.org/10.1111/j.1742-1241.2012.02939.x

Palis, A. G., & Quiros, P. A. (2014). Adult learning principles and presentation pearls. *Middle East African journal of ophthalmology, 21*(2), 114-122. Retrieved from https://doi.org/10.4103/0974-9233.129748

Palleschi, M. T., Sirianni, S., O'Connor, N., Dunn, D., & Hasenau, S. M. (2014). An interprofessional process to improve early identification and treatment for sepsis. *Journal for Healthcare Quality, 36*, 23-31. Retrieved from https://doi.org/10.1111/jhq.12006

Prescott, H., Langa, K., Liu, G., & Iwashyna, T. (2014). Increased 1-year healthcare use in survivors of severe sepsis. *American Journal of Respiratory and Critical Care Medicine, 190*(1). Retrieved from http://dx.doi.org/10.1164/rccm.201403/0471OC

Rhee, C., Gohil, S., & Klompas, M. (2014). Regulatory mandates for sepsis care. *New England Journal of Medicine,* 370(8), 1673-1676. Retrieved from https://doi.org/10.1056/nejmp1400276

Rhodes, A., Evans, L., Alhazzani, W., Levy, M., Antonelli, M., Ferrer, R. … Dellinger, R. (2017). Surviving Sepsis Campaign: International guidelines for management of sepsis and septic shock. *Critical Care Medicine*. 45(3), 486-552. Retrieved from http://doi:10.1097/ccm.0000000000002255.

Romero, B., Fry, M., & Roche, M. (2017). The impact of evidence-based sepsis guidelines on emergency department clinical practice: A pre-post medical record audit. *Journal of Clinical Nursing, 26*(21-22), 3588-3596. Retrieved from https://doi.org/10.1111/jocn.13728

Rowe, T., Araujo, ., Van Ness, P, Psani, M., Juthani-Mehta, M. (2016). Outcome of older adults with sepsis at admission to an intensive care unit. *Open Forum Infectious Diseases*. 3(1). Retrieved from https://doi.org/10/1093/ofid/ofw010

Singer, M., Deutschman, C., Seymour, C., Shankar-Hari, M., Annane, D., Bauer, M., . . .

Hotchkiss, R. S. (2016). The third international consensus definitions for sepsis and septic shock (sepsis-3). *Journal of American Medical Association, 315*(8), 801-810. Retrieved from https://doi.org/10.1001/jama.2016.0287

Sivapalan, P., & Staehr, J. (2015). Timing of therapy in sepsis: Are early antibiotics important for prognosis? *Critical Care Medicine, 43(9)*, 2030-2031. Retrieved from https://doi.org/10.1097/ccm.0000000000001179

Surviving Sepsis Campaign. (n.d.). About the surviving sepsis campaign. Retrieved from http://www.survivingsepsis.org

Torsvik, M., Gustad, L., Mehl, A., Bangstad, I., Vinje, L., Damas, J., & Solligard, E. (2016). Early identification of sepsis in hospital inpatients by ward nurses increases 30-day survival. *Critical Care, 20*, 244. Retrieved from https://doi.org/10.1186/s13054-016-1423-1

Tromp, M., Hulscher M., Bleeker-Roberts, C., Peters, L., van den Berg, D., Borm, G., . . . Pickkers, P. (2010). The role of nurses in the recognition and treatment of patients with sepsis in the emergency department: A prospective before-and-after intervention study. *International Journal of Nursing Studies, 47*(12), 1464-1473. Retrieved from https://doi.org/10.1016/j.ijnurstu.2010.04.007

Vandijck, D. M., Blot, S. I., & Vogelaers, D. P. (2009). Implementation of an evidence-based sepsis program in the intensive care unit: evident or not? *Critical Care*, *13*(5), 193. Retrieved from http://doi.org/10.1186/cc8056

Vincent, J. L. (2002) Sepsis: The magnitude of the problem. In J. L. Vincent, J. Carlet, & S. M. Opal (Eds.), *The Sepsis Text* (pp. 1-9). Boston, MA: Springer.

Yealy, D. M., Huang, D. T., Delaney, A., Knight, M., Randolph, A. G., Daniels, R., & Nutbeam, T. (2015). Recognizing and managing sepsis: what needs to be done? *BMC Medicine, 13*, 98. Retrieved from http://doi.org/10.1186/s12916-015-0335

Appendix A: Sepsis Bundles

HOUR ONE BUNDLE: INITIAL RESUSCITATION FOR SEPSIS AND SEPTIC SHOCK (BEGIN IMMEDIATELY):

1) Measure the lactate level. *
2) Obtain blood cultures before administering broad-spectrum antibiotics.
3) Administer broad-spectrum antibiotics until cultures resulted
4) Begin rapid administration of 30ml/kg crystalloid for hypotension or lactate ≥4 mmol/L.

*Remeasure lactate if initial lactate elevated (> 2mmol/)

SIX HOUR BUNDLE

Apply vasopressors if hypotensive during or after fluid resuscitation to maintain a mean arterial pressure ≥ 65 mm Hg.
In the Event of Persistent Arterial Hypotension Despite Volume Resuscitation (Septic Shock) or Initial Lactate ≥4 mmol/L (36 mg/dL):

Maintain Adequate Central Venous Pressure

In the event of persistent hypotension despite fluid resuscitation (septic shock) or lactate ≥4 mmol/L (36 mg/dL) measure central venous pressure (CVP). (The target for CVP is >8 mm Hg.)

Appendix B: Sepsis Protocol

Sepsis Protocol and Screening Tool

Section I - Systemic Inflammatory Response Syndrome - SIRS (two or more of the following)

Temperature greater than or equal to 101F or less than or equal to 96.8F

Heart rate greater than 90 BPM
Respiratory Rate greater than 20 breaths per minute
WBC greater than or equal to 12,000/mm3 or less than or equal to 4,000/mm3 or greater than 0.5 K/UL bands
Blood glucose greater than 140 ml/dL in non-diabetic patient
Negative screen for severe sepsis

If two of the above continue to infection Section II

Section II - Infection (one or more of the following):

Suspected or documented infection
Patient is receiving antibiotic therapy
If check none above – negative screen for severe sepsis
If check one above – answer infection question YES, call physician for serum lactic acid order

Section III - Organ Dysfunction
One or more of the following within 3 days of new infection

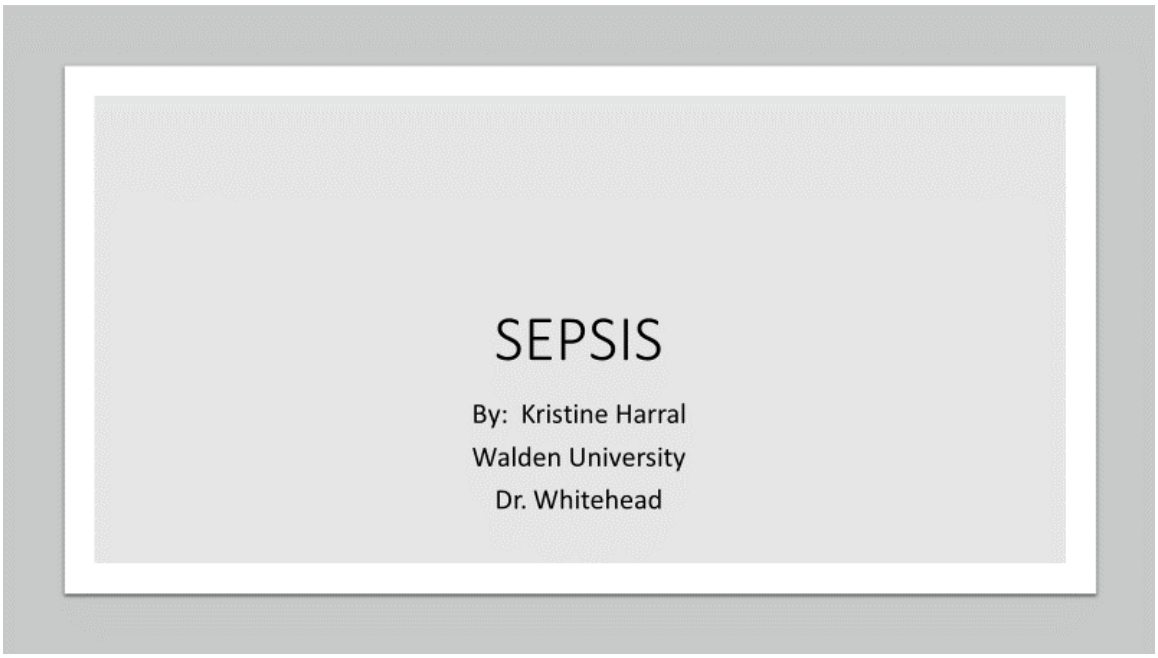
Respiratory, Sa02 less than 90% OR increasing 02 requirements
Cardiovascular: SBP less than 90mm/Hg OR 40mmHg less than baseline or MA less than 65mmHg
Renal: Urine output less than 0.5ml/kg/hr; creatinine increases of greater than 0.5mg/dl from baseline
Patient has altered consciousness
Glascow Coma Score less than or equal to 12
Hematologic: platelets less than 100,000; INR greater than 1.5
Hepatic: Serum total bilirubin greater than or equal to 4mgdl
Metabolic: Serum lactic acid greater than or equal to 2mEq/L

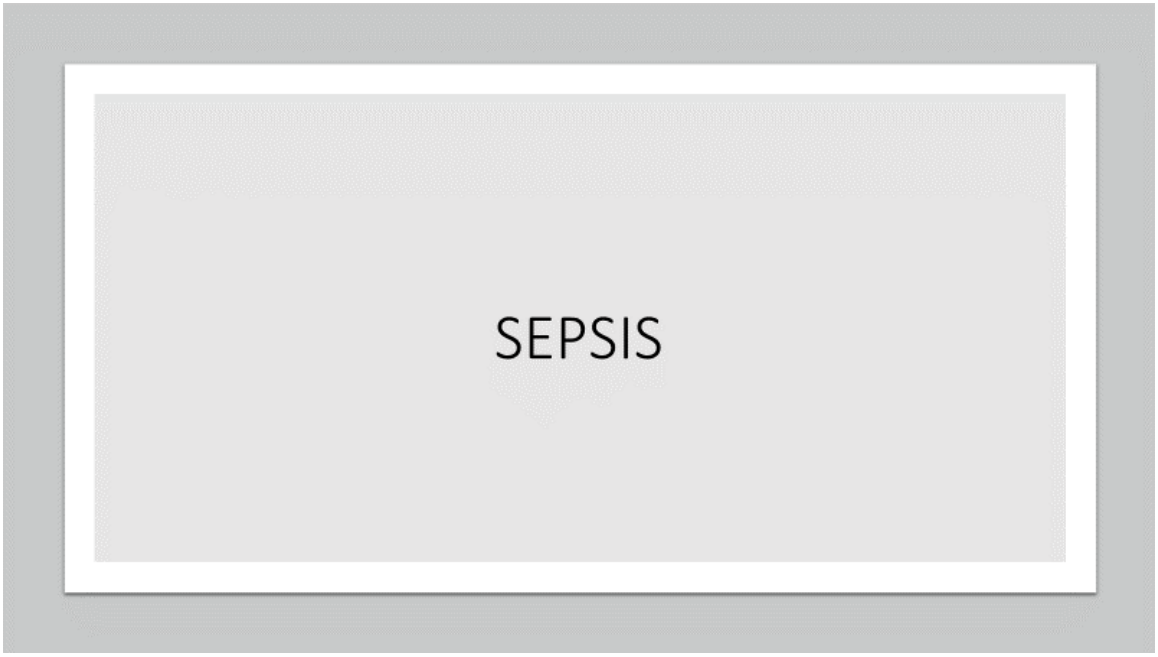
Section IV - Negative screen for severe sepsis

If check one in Section III or there is a cause for a severe sepsis alert, patient has screened positive for severe sepsis

Call sepsis rapid response team
Call practitioner, PA or NP and implement urgent sepsis protocol
Initiate or ensure IV access with 18g or 20g catheter
Obtain blood gas, serum lactic acid, CBC (if it has been greater than 12 hours since last test), two sets of blood cultures (if greater than 24 hours since last set)
If patient is hypotensive, give crystalloid (NS) fluid bolus – 30ml/kg over one hour or as fast as possible until hypotension resolved unless known EF is less than 35% or active treatment for heart failure

Appendix C: Sepsis Education Program





OBJECTIVES

- Definitions
- Statistics
- Incidence
- Early warning signs
- Organ dysfunction
- Interventions

DEFINITION
WHAT IS SEPSIS?

- Sepsis is a life-threatening condition that arises when the body's response to an infection damages it's own tissues and organs
- It can lead to shock, multiple organ failure and death, especially if not recognized early and promptly treated

- Infection + SIRS = Sepsis

DEFINITION
Systemic Inflammation Response Syndrome

- Systemic Inflammation Response Syndrome (SIRS) is the body's response to an insult that results in the activation of the immune system. The inflammatory response is the body's way of attempting to maintain homeostasis.

DEFINITION
Septic Shock

Septic shock is a sepsis induced state of severe hypotension despite aggressive fluid therapy

DEFINITION
Multiple Organ Dysfunction Syndrome (MODS)

MODs is a progressive dysfunction in two or more organs of the body after the onset of sepsis where interventions are needed to sustain life

DEFINITIONS

- Sepsis – A patient with systemic manifestations of infection plus a documented infection
- Severe sepsis – A patient with sepsis complicated by organ dysfunction, tissue hypo perfusion, or sepsis-induced hypotension
- Tissue hypo perfusion – An elevated serum lactate level or oliguria
- Sepsis-induced hypotension – Systolic B/P of greater than 90mmHg, a mean arterial pressure of greater than 70mmHg, or a decrease in systolic B/P of greater than 40mmHg below normal in the absence of other causes

SEPSIS STATISTICS

- Systemic inflammatory response to the presence of an infection
- Progresses quickly causing circulatory systemic dysfunction and multiple organ failure
- Result in death
- High mortality and morbidity rates
- Affects elderly, infants, and immunocompromised patients
- 65 year old adults are 13 times more likely to be hospitalized than younger than 65 years old
- Affects 750,000 per year

INCIDENCE OF SEPSIS

- Bacterial infections are the most common causes of sepsis
- Fungus
- Parasitic or viral infections
- Larger population of immunocompromised patients
- Increased resistant organisms
- Surgical procedures – SSI's
- Wounds
- Critical illness in elderly
- Diabetic population increasing

EARLY WARNING SIGNS

- Requires two or more of the following:
- Heart rate greater than 90 BPM
- Body temp great than 100.4F or less than 96.8F
- Respiratory rate greater than 20 breaths/minute
- WBC greater than 12,000/mm3 or less than 4,000/mm3 or greater than 10% immature neutrophils or bands
- PaCo2 less than 32mmHg (normal 35 to 45mmHg)

SIGNS OF ORGAN DYSFUNCTION

- Altered mental status
- Acute oliguria (urine output less than 0.5ml/kg/h)
- Hyperglycemia in the absence of diabetes
- Hypoxemia
- Coagulopathy (INR greater than 1.5)
- Gastric Ileus

ACUTE ORGAN SYSTEM FAILURE

- Cardiovascular
  - Tachycardia – SBP <90mmHg; MAP <70mmHg (despite fluid)
  - Arrhythmias
  - Hypotension
  - Elevated central venous and pulmonary artery pressures
- Respiratory
  - Tachypnea
  - Hypoxemia

ACUTE ORGAN SYSTEM FAILURE

- Renal
  - Oliguria – 0.5 ml/kg per hour (despite fluid)
  - Anuria
  - Elevated creatinine

ACUTE ORGAN SYSTEM FAILURE

- Hepatic
  - Thrombocytopenia
  - Coagulopathy
  - Decreased protein C levels
  - Increased D-dimer levels
- Neurologic
  - Altered consciousness
  - Confusion
  - Psychosis

ACUTE ORGAN SYSTEM FAILURE

- Hematologic
  - Jaundice
  - Elevated liver enzymes
  - Decreased albumin
  - Coagulopathy
  - Platelets 80,000/mm3 – decline in platelet count of 50% over 3 days
- GI
  - Ileus (absent bowel sounds)

ACUTE ORGAN SYSTEM FAILURE

- Metabolic
  - Unexplained metabolic acidosis
  - Lactate >1.5 times upper normal

HEMODYNAMIC SUPPORT

- Vasopressor

  A vasopressor should be initiated in order to achieve minimal perfusion pressure

  The goal is to maintain a MAP above 65mmHg.

COMPLICATIONS OF SEPSIS

- Acute respiratory distress (ARDS)
- Acute Renal Failure
- GI Complications
- Disseminated intravascular coagulation (DIC)
- Multiple organ dysfunction syndrome (MODS)

ARDS

- An abrupt onset of respiratory distress with three components: Severe hypoxemia, bilateral pulmonary infiltrates, and absence of heart failure or fluid overload
- Three phases of ARDS:
  - Acute exudative – profound hypoxemia, inflammation and diffuse alveolar damage
  - Fibro proliferative decrease compliance and increased dead space
  - Resolution – may take 6 to 12 months or longer

ACUTE RENAL FAILURE

- Develops as a result of endotoxins, which cause vasoconstriction
- Renal damage is related to the degree and severity of sepsis
- Acute tubular necrosis may occur due to ischemia
- It is reversible with careful monitoring of urine output, serum creatinine and blood urea nitrogen (BUN)

GI COMPLICATIONS

- Can develop when blood flow is redistributed
- Stress ulcers in the stomach may occur
- Bleeding is common and can occur two to ten days after the insult

DIC

- Cause by coagulation cascade activation
- Clots are formed, blocking small vessels
- Depletion of platelets and coagulation factor increases the risk of bleeding
- Fibrin deposits in organs can cause ischemic damage and failure

MODS

- Occurs when multiple organs are damaged such as kidneys, liver, lungs, brain and heart may be affected
- Mortality rate increase with the number of failing organs

DIAGNOSIS OF SEPSIS

- Key is early detection
- Aggressive treatment has been shown to decrease mortality by 30% or septic patients
- LABS
  - Serum Electrolytes
  - Complete blood cells count (CBC)
  - Coagulation studies
  - ABG – altered blood gas
  - Cultures of sputum, urine, cerebrospinal fluid and wound drainage/culture

INTERVENTIONS

- Give 100% oxygen via non-re-breather mask
- Obtain two separate blood cultures before ABX therapy
- Initiate ABX therapy within one-hour
- Initiate fluid resuscitation
- Obtain Lactate and HGB-A lactate levels
  - Septic shock is diagnosed when the lactate level is greater than 4mmol/L in the presence of severe sepsis
  - Consider blood transfusion for a patient with HGB value less than 7g/dL
- Insert urinary catheter to monitor hourly urine output
- Vasopressors – norepinephrine is the drug of choice to restore hemodynamic stability

OXYGEN AND BLOOD CULTURES

- Metabolic demands may require intubation/mechanical ventilation of ABG's determinate or blood PH decreases
- Obtain two separate blood cultures: One percutaneous and one via each vascular access device unless just inserted

STRICT GLYCEMIC CONTROL

- Strict glycemic control
- Blood glucose level should be maintained less than 150m/dl
- All patient receiving IV insulin should receive a glucose calorie count and blood glucose levels should be assessed every 1-2 hours then every 4 hours

ANTIBIOTIC THERAPY

- Use broad-spectrum ABX is used initially; D/C in 3-5 days
- ABX therapy is modified after culture results obtained
- Single ABX therapy may last seven to 10 days which may be longer in immunocompromised patients or in undrainable infections
- The dosage is adjusted based on renal function

FLUID RESUSCITATION

- Fluid Resuscitation is vital
- Crystalloid salutation 0.9 sodium chloride or Lactated Ringer's
- Colloids – Albumin
- Keep mean arterial pressure above 65mmHg, wedge pressure at 6-12mmHg, and central venous pressure (CVP) at 8-12mmHg.
- Fluid challenges may be given based on B/P and urine output
- Corticosteroids indicated in adult patients with hypotension not responding to fluids or vasopressors

NURSING INTERVENTIONS

- Infection control measures – good hand hygiene
- Assessment and monitoring: ongoing V/S; neuro checks; signs of DIC; bleeding from invasive devices
- Documentation
- Communication with practitioners
- Communication with patient and family

Appendix D: Pre- and Posttest

1. What is sepsis?
    A. Infection + SIRS
    B. Wound
    C. Fever
    D. Sore muscles
2. How many people are affected by sepsis each year?
    A. 250,000
    B. 750,000
    C. 500,000
    D. 300,000
3. Complications from Sepsis can include:
    A. GI complications
    B. ARDS
    C. MODS
    D. All the above
4. What blood test is used to assess tissue perfusion in a patient with sepsis?
    A. Lactate
    B. CKMB
    C. TSH
    D. CBC
5. When should antibiotic therapy begin for suspected sepsis?
    A. One Hour
    B. Four Hours
    C. Six Hours
    D. Two Hours
6. The goals initial resuscitation of sepsis-induced hypoperfusion should include all of the following as one part of a treatment protocol, does NOT include:
    A. Central Venous Pressure
    B. Mean Arterial Pressure
    C. Urine Output
    D. Pain
7. What two symptoms constitute sepsis?
    A. Heart rate greater than 90 BPM and Respiratory Rate greater than 20 breaths/minute
    B. Increased urine output and pain
    C. Temperature 98.6 and WBC 6,000
    D. Numbness and tingling
8. Antibiotics to be used for the first 3-5 days are:
    A. Gram negative
    B. Broad spectrum
    C. Penicillin
    D. Quinolones

9. Septic shock is defined as a subset of sepsis in which the patient has profound:
    A. Delirium
    B. Dehydration
    C. Hypoperfusion
    D. Alzheimer's
10. Which of the following is NOT likely to be a complication after surviving sepsis?
    A. Insomnia
    B. Improved Memory
    C. Post traumatic stress syndrome (PTSD)
    D. Amputations
11. Adults older than 65 are ____ times more likely to be hospitalized with sepsis than adults younger than 65.
    A. 20
    B. 5
    C. 13
    D. 27
12. When someone has severe sepsis their chances of survival drops by almost 8% for every ____ that goes by without treatment.
    A. Minute
    B. Day
    C. Hour
    D. None of the above
13. Who is at highest risk for developing sepsis?
    A. Newborn babies
    B. People with cancer
    C. People over 65 years old
    D. All the above
14. All the following are signs of sepsis EXCEPT:
    A. Extreme pain or discomfort
    B. Fever
    C. Confusion
    D. Rapid Breathing

Appendix E: Education Survey

Knowledge and Confidence Survey

Please take the time to complete this evaluation regarding your knowledge and confidence in caring for patients with sepsis. Your insight and experience will assist in enhancing future teachings.

For the following questions, please rate your confidence level from very poor to very good on a scale 1-10.

1. Please rate your knowledge of sepsis.

   Very Poor Very Good
   1 2 3 4 5 6 7 8 9 10

2. Please rate your knowledge of severe sepsis.

   Very Poor Very Good
   1 2 3 4 5 6 7 8 9 10

3. Please rate your knowledge of SIRS.

   Very Poor Very Good
   1 2 3 4 5 6 7 8 9 10

4. Please rate your confidence in taking care of someone with sepsis.

   Very Poor Very Good
   1 2 3 4 5 6 7 8 9 10

5. Please rate your knowledge of early warning signs of sepsis.

   Very Poor Very Good
   1 2 3 4 5 6 7 8 9 10

6. Please rate your knowledge on how to treat the onset of sepsis.

   Very Poor Very Good
   1 2 3 4 5 6 7 8 9 10

7. Please rate your confidence in implementing a sepsis protocol into practice.

Very Poor Very Good

1 2 3 4 5 6 7 8 9 10

8. Please rate your confidence in implementing the sepsis bundles.

Very Poor Very Good

1 2 3 4 5 6 7 8 9 10

9. Please rate your confidence on recognizing the early warning signs of sepsis.

Very Poor Very Good

1 2 3 4 5 6 7 8 9 10

ADDITIONAL POST SURVEY QUESTIONS.

10. Please rate your confidence level of sepsis after the training.

Very Poor Very Good

1 2 3 4 5 6 7 8 9 10

11. Please rate your confidence in caring for patients with sepsis post training.

Very Poor Very Good

1 2 3 4 5 6 7 8 9 10

Any other comments or questions?